

may be constructed by using a computer, for example.

The present invention may be applied not only to the Bernus-type ion source, but also to other types of ion sources each using a filament for emitting thermoelectrons. An example 5 of such is a Freeman-type ion source having a linear filament.

As seen from the foregoing description, the resistance value of the filament, which remains unchanged even if the filament current is changed to change the output of the ion source is used as an object to be measured, and a lifetime of 10 the filament is predicted based on the result of the measurement. Accordingly, even if the output of the ion source 2 is not constant, the lifetime of the filament 10 can be predicted exactly.

**What is claimed is:**

1. A method of predicting a lifetime of a filament 15 for emitting thermoelectrons in an ion source, the method comprising:

successively measuring a resistance value of the filament during an operation of the ion source on the basis of current flowing through the filament and voltage across the filament; 20 and

predicting the lifetime of the filament till the filament will be broken, on the basis of a rate of change of the resistance value.

25 2. A method of predicting a lifetime of a filament

according to claim 1, further comprising:

computing a time till an application limits of the filament or a time left till the application limits of the filament, on the basis of a rate of change of the resistance value.

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3. An ion source device comprising:

an ion source having a filament for emitting thermoelectrons;

a current measuring device for measuring current flowing 10. through the filament;

a voltage measuring device for measuring voltage across the filament;

a resistance operation device for computing a resistance value of the filament by using the current and the voltage 15 measured by the current and voltage measuring devices; and

a prediction operation device for computing a time till an application limits of the filament or a time left till the application limits of the filament, on the basis of a rate of change of the resistance value computed by the resistance 20 operation device..

4. An ion source device according to claim 3, further comprising:

a display device for displaying the time till the 25 application limits of the filament or the time left till the

application limits of the filament.

5. An ion source device according to claim 3, further comprising:

a comparing device for comparing the time left till the application limits of the filament with a predetermined reference value, and producing an alarm signal when the time left till the application limits of the filament is smaller than the predetermined reference value.

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